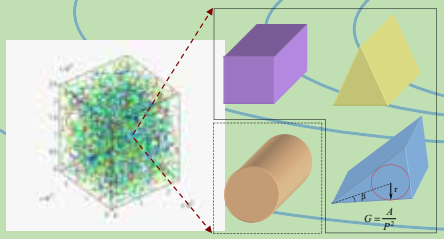
Lawrence Berkeley National Laboratory

Scientific and Technological Approaches to Emerging Problems in Water Supply

Assessment, Prediction and Decision Support

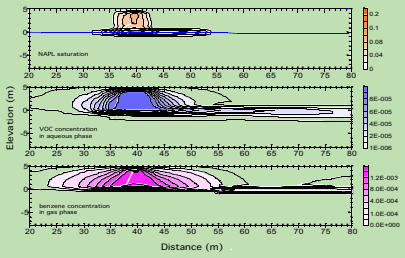
- Develop and apply modeling and assessment tools to evaluate water supply and demand.
- Identify energy / water constrained areas, integrate energy / water management.
- Model feasibility and cost of engineering changes on water use efficiency in economic life-cycle cost analysis.
- Characterize groundwater and surface water systems; advanced hydrologic testing and geophysical tomography.
- Monitor, model and predict water supply and quality: for complex hydrology, multi-phase processes, with biogeochemistry.



Basis for flow permeability in rocks: Study of pore shapes and connectivity

Basic Science

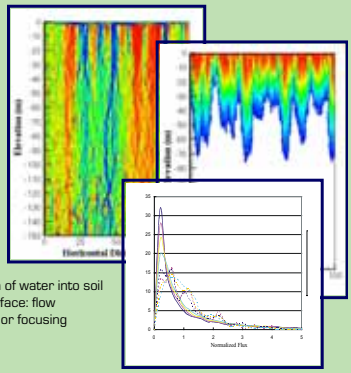
- Develop new water resource analysis tools based on coupled atmosphere, land surface water, deep groundwater and water-energy use.
- Model and analyze variability in sources of water supply; advance understanding of water cycle storages, fluxes, and interfaces.
- Research multiphase flow processes from pore scale to regional scale.
- Evaluate interdependence of critical resources, including energy production and use with water cycle variability and water quality.



TMVOC: An advanced numerical model for multiphase flow in complex geological formation

Technological Innovation

- Increase efficiency in water supply and treatment systems, including biodegradation methods and UV Waterworks, a device that uses UV light to remove micro-organisms in drinking water energy-efficiently.
- Decrease energy and water use by industries and buildings.
- Increase effectiveness of detection and analysis of contaminants in water.



Percolation of water into soil and subsurface: flow channeling or focusing

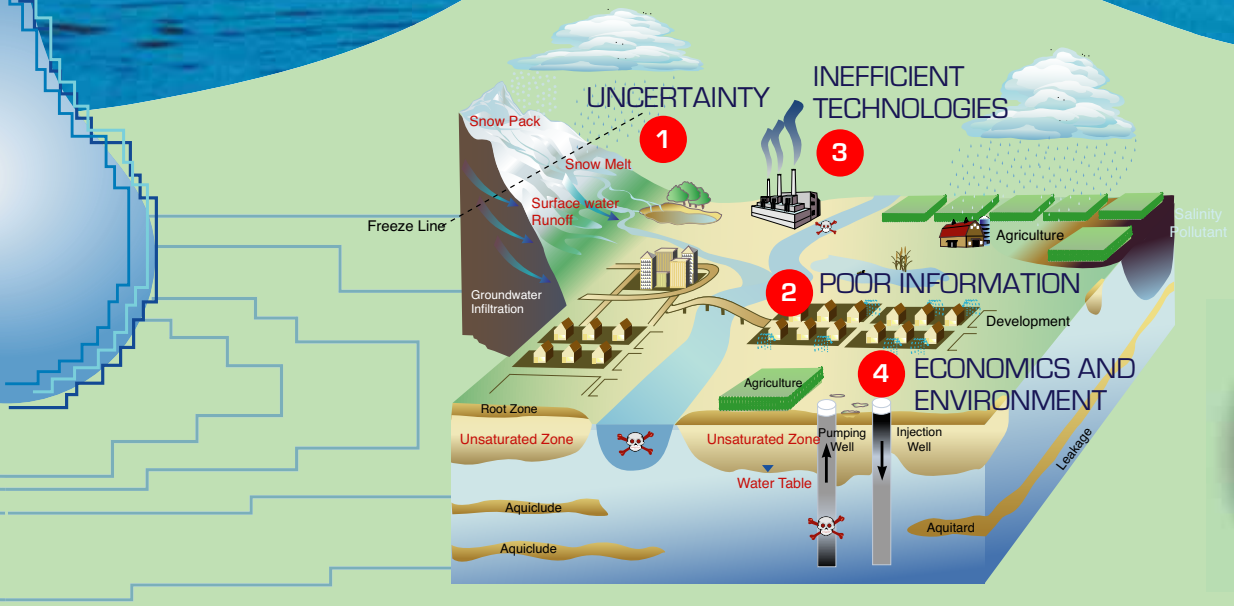
Implementation and Technology Transfer

- Co-Chair Workshop on the G-8 Global Earth Observing System of Systems (GEOSS) Implementation Plan and the International Water Cycle Ten Year Roadmap on Hydrology and Water Resources.
- Pilot projects for field-scale technology demonstration.
- Improve methods for predicting environmental and economic impacts.
- Outreach to stakeholders for planning and information transfer.

Coupling of climatic processes with land surface and ground water system

HTTP://WATER-ENERGY.LBL.GOV

WWW.LBL.GOV



PROBLEMS:

1. Statistical information about water quality, water supply, and climate variability is uncertain and a framework is needed to guide policy.

2. More information is needed on the connections between climate and snow pack levels and their long-term effects on surface and ground water quantity and quality.

3. Consumers and industrial plants do not always use the best technologies and practices to conserve energy and water, and water-using products and services are not always water efficient.

4. Energy and environmental impact and cost ramifications of adopting or abandoning specific water supply options are frequently ignored.

BERKELEY LAB'S CONTRIBUTIONS:

1. Apply real-time measurement technology integrated with regional climate and energy modeling to predict supply, demand, and environmental impact of water use and policy.

2. Develop advanced hyrdrologic testing and geophysical survey methods and new models of coupled hyrological-chemical processes of water systems.

3. Develop test procedures, protocols, labels, databases and guides for water- and energy-efficiency; develop real-time forecasting and management techniques to control quality.

4. Integrate analysis of avoided production costs and evaluation of environmental costs and benefits to understand the marginal opportunity cost of energy and water saved through Best Management Practices ("BMPs").

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